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Review Article

Study of Aladdin Normal and Magic Heat Storage/Generator Thermoses for Maintaining Meal Hotter

Shyam S Nandwani*

Retired Professor, Researcher, Promotor and User of Solar Energy, Costa Rica

***Corresponding Author:** Shyam S Nandwani, Retired Professor, Researcher, Promotor and User of Solar Energy, Costa Rica.

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Abstract

The main advantage of thermoses is to maintain the meal hot or cool for longer period. After studying different thermoses in the previous work, here in this paper Aladdin Normal and Aladdin heat storage Magic Thermoses are studied experimentally to see their performance for maintaining the food hotter for longer period, as claimed by the manufacturer. Although Magic thermos is found to be somewhat better for about 30-60 minutes, however, has some inconveniences too for the users. Thus, some precautions must be taken by the user of Magic Thermos.

Keywords: Normal Food Thermos Bottles; Heat Storage Thermos Bottle; Microwaveable Thermos; Transition Temperature

Introduction

This paper is the continuation of previous work, with the objective to get hot meals during lunchtime, in Educational Centers and in the offices. As observed by the author during more than 45 years, practically all the students and office workers carry their plastic lunch boxes and heat in Microwave Ovens. In previous work, I have used direct Sun light, Solar Ovens combined with Microwave oven to heat lunch [1-4]. In the recent work we have studied Six Thermoses (Figure 1) to see their performance including Aladdin Microwaveable thermos [5].

As explained in the previous paper [5], Aladdin normal thermos is just a conventional thermos with plastic material and vacuum insulation. It has the advantage that meals can be heated in the morning directly in MW Oven (rather than transferring heat from cooking pot), and can be carried to the office/ college etc. and get the hot lunch after 5-6 hours.



Figure 1: Different types of Thermoses studied in previous work [5].

After this work, I have come to know of Aladdin Magic Thermos, where the company mention, that this thermos in addition to conventional Aladdin thermos, has also some Salt (Phase Change Material) added at bottom of bottle, which generates heat and add to thermal performance, maintaining the meal hot for some longer time.

The main objective of this paper is to see any extra advantage, because of curiosity and some possible application for other uses etc. With lot of difficulty, I could find and bought two thermoses of this type to study and compare them with conventional Aladdin thermos.

The normal Aladdin Thermos only preserves heat, whereas according to the Aladdin Company, Micro Magic thermos generates new heat. No details are mentioned by the company. But it's known that it used a phasechange heatstorage material (PCM) sealed between the walls or at the bottom. When microwaved, the PCM absorbs heat and get melted. As it slowly solidified, it released heat back into the food. This gave the effect of "extra heat generation," even though it is stored heat. Figure 2 shows Aladdin Conventional (Yellow/Red) and Magic (Blue) Thermoses. Both can accommodate 250- 300g of meal.



Figure 2: Aladdin Conventional (left) and Magic (right) Thermoses.

The company does not mention the name, quantity and properties of salt, could be due to Business secret. Only mention that this/salt can maintain the food hot for longer time, due to generation of heat because of the salt.

Experimental performance

For study I have used pinto (or Gallo pinto) as meal, one of the typical meals in Costa Rica. It is like rice and beans (black or red) with some natural spices (Figure 3). Combination of both is delicious and nutritious meal and can be made in the house and even one can buy readymade at some grocery shops. Specific heat capacity of Pinto is lower than water. Based on Chat Gpt/Copilot I have taken heat capacity as 0.8 kCal/kg °C.



Figure 3: Typical Costa Rican Meal, Pinto (Rice and black beans).

Theoretical study of thermal analysis is not simple, as name, mass, melting temperature and latent heat of Phase Change material inside the box is not known. To know the performance of both thermos I studied in two different ways.

Study based on the instructions provided on the box itself. Comparative Study with both thermoses.

Reading carefully the box of Aladdin Magic, it says, ideal for keeping your foods hot that are already hot. Pour water (not mentioned quantity) into the bottle and microwave (does not mention time or temperature, except do not heat Magic thermos for more than 4 min.). Then discard the hot water and add your hot food. Close the thermos. After doing that I measured fall in pinto temperature, at least until eatable temperature (40-41 °C) and noted the time taken to reach this temperature. While with the normal Aladdin thermos, just kept the same/similar quantity of hot meals and measured the fall in temperature and the time taken to fall temperature to 40-41 °C.

Due to hot water and unknown magic salt, plastic temperature may increase and insulating material may not resist. It happened in one of the studies.

As the box does not mention, I tried 300 ml of water and heated it for 2.5, 3.0 and 3.5 min. in 1200W Microwave oven. I used this MW Oven as it was available in the house and also Magic thermos could also fit in this Oven.

Although the experiment was performed on June 11, 2026, morning and June 11, 2026, evening, July 20, 2026, and July 22, 2026 and September Sept. 9, 2026, however we will report data for last three days. We study the thermoses kept in the thermal bag to minimize the thermal losses. Any way practically all the users carry the thermos in some bag.

A1: Sept. 9, 2026. In the case of Normal Aladdin thermos, just put 250g of the Hot pinto (around 90 °C). Close and put in thermal bag. In the case of Magic Thermos, heated 300 ml of water in Microwave Oven for 3 min. Discarded this hot water and then put 250g of hot pinto (about 90 °C). Closed and put thermos in Thermal Bag. Started measuring fall in pinto temperature (in both thermoses) until reached about eatable temperature, 40-41 °C.

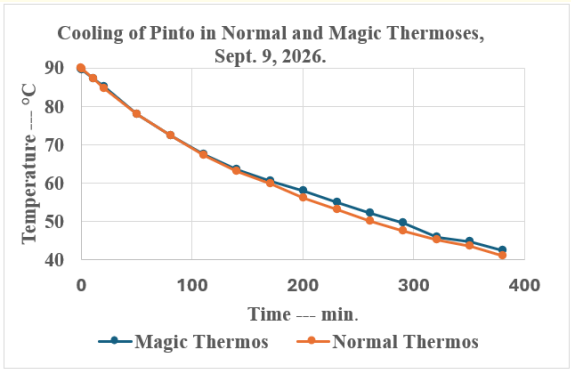


Figure 4a: Comparative study of cooling of 250g of pinto in Normal and Magic Thermos on Sept. 9, 2026.

The temperature variation of pinto is shown in Figure 4a. Figure 4b shows the part of the graph near to Phase Change Transition of salt.

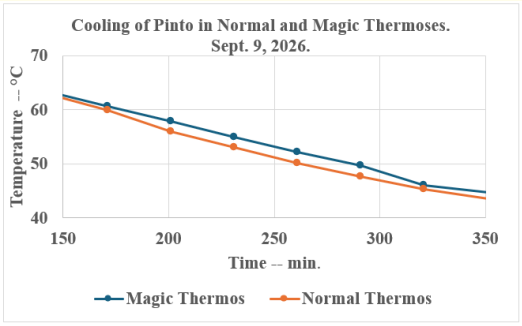


Figure 4b: Comparative study of cooling of pinto in Normal and Magic Thermoses on Sept. 9, 2026, near to Phase change Transition.

Although both thermoses show good performance. In the normal Thermos, meals could stay hot until 362 min. while 381 min. in Magic thermos. Advantage of about only 20 min.

Also, we observed that for 170-300 minutes (around pinto temperature of 55-60 °C) the magic thermos shows better performance- probably it could be due to transition temperature of Magic Salt to liquid.

A2. July 20, 2026. Heated 300 ml of water for 3.5 min, in Magic Thermos. Discarded water. Added 300g of Pinto in Magic Thermos. On the other hand, for comparison, I added 250g hot Pinto in Normal Aladdin thermos (less pinto and thus less time for heating). In both cases pintos were heated for 3 min. Both thermoses were closed and measured the fall in temperature. The results are shown in Figure 5.

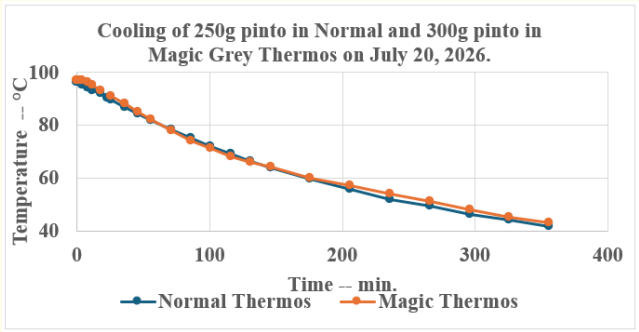


Figure 5: Comparative study of cooling of pinto in Normal and Magic Thermos on July. 20, 2026.

In normal Aladdin the pinto temperature dropped from 96 to 39.6 °C in 376 min. (6 hrs. and 16 min,) whereas in Blue Magic the pinto temperature dropped from 97 to 40 °C in 400 min (6 hrs. and 40 min.). Advantage of 24 minutes in Magic Aladdin. Although there is advantage of only 24 minutes, I lost my Alladin Magic grey thermos (Figure 6) due to heating of water for 3.5 min. Thus, I recommend the user to be careful.

A3. July 22, 2026. Experiment was repeated on July 22. Again 300 ml of water was heated in Magic Thermos for 3 min (in second thermos, blue). Discarded water and put 300g of heated pinto in the Magic thermos. On the other hand, put 250 g of heated pinto in Normal Aladdin thermos. Both pintos were heated for 3 min.



Figure 6: Problem with one of the Magic Thermos grey due to overheating.

Closed bottles inserted digital thermometers with sensors and measured the fall in temperature. Results are shown on Figure 7.

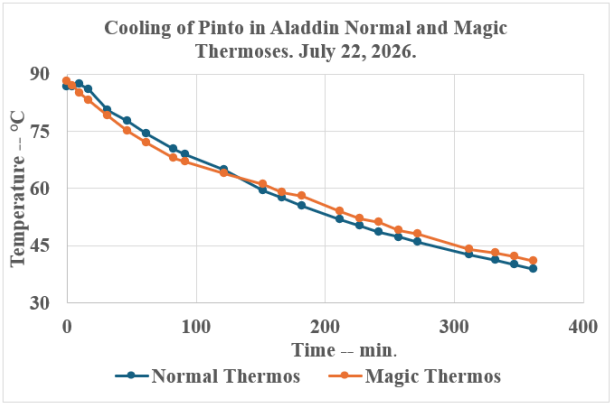


Figure 7: Variation of hot pinto temperature in Normal and Blue Magic Thermos with time.

The results show that Pinto temperature dropped from 86.7 to 39.9 °C in 347 min. (5hrs. 47 min.) in Normal Aladdin whereas in Magic Thermos, pinto temperature dropped from 88 to 40 °C in 387 min. (6 hrs. 10 min.). Although both thermoses show good performance, Magic thermos shows better (40 min. long) performance. Again the difference of Temperature in both thermoses can be observed during phase transition (50-60 °C).

Heating of pinto ONLY with heat generated from Magic/salt

To have some idea of the quantity of heat generated/gained from magic salt, I thought of doing another experiment. In this study, most direct and more relevant experiments were performed for 6-7 days. No data was measured with Normal Aladdin Thermos.

B1. June 26, 2026. Heated 300 ml of water in Magic thermos for 3.5 min. in MW Oven. The water was discarded and put 250g of cooked pinto at about ambient temperature in Magic Thermos. Also put the Magic thermos in thermal bag. The rise in pinto temperature due to heat generated by Phase Change Material (PCM), was measured with time. The variation is shown on Figure 8.

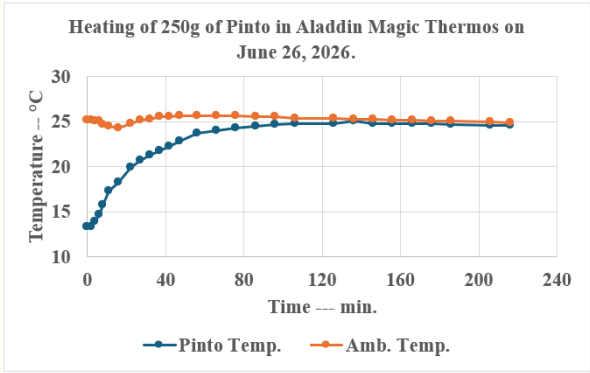


Figure 8: Rise in Pinto temperature due to heat generated by PCM salt on June 26, 2026.

In 136 minutes (2 hrs. and 16 min.) the pinto temperature increased from 13.3 C to 25.1 °C (δT =11.8 °C). The ambient temperature during this period was 24-25 °C. One can calculate additional heat added and the temperature increased as is shown in Table 1.

B2. Similar experiments were performed on July 15, 2026, July 16, 2026. June 25, 2026, and July 19, 2026. In all these studies the Magic thermos was kept in Thermal Bag. The pinto heated was always 250g. Results for July 15, 2026, are shown in Figure 9.

In 113 minutes (1 hr. and 53 min.) the pinto temperature increased from 11.6 C to 27.6 °C (δT =16 °C). The ambient temperature during this period was 29-26 °C. The reason of increased higher temperature was due to more heating of magic salt.

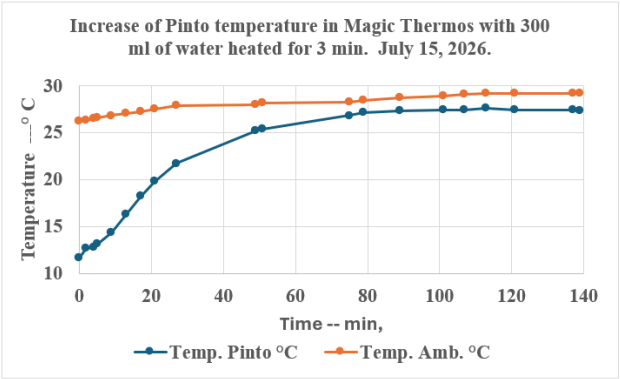


Figure 9: Increase in pinto temperature due to generation of Heat from PCM, July 15, 2026.

Summary of all these data are shown in Table 1. In all the experiments 300 ml of water heated in Thermos and water was discarded. Then 250 g of pinto was added.

Pinto got heated by 11.8 to 19.1 °C and gained energy from 2.4 to 3.8 KCal (10-16 KJ) just from the magic salt.

Date	Water Heated ml	Time min.	Qi Kcal	Meal heated gm	Rise Temp C	Time min	Qu Kcal
26/6/26	300	3.5	60.2(*)	250	13.3-25.1 (11.8)	136	2.36(**)
15/7/26	300	3.0	51.5	250	11.6-27.6 (16)	113	3.2
16/7/26	300	4.0	68.7	250	31.2-12.1 (19.1)	108	3.82
25/6/26	300	3.5	60.2	250	33-47 (14)	67	2.8
19/7/26	300	3.5	60.2	250	0 29-47 (18)	70	3.6

Table 1: Heat provided by Magic Salt and Gained by Pinto. Microwave Oven Used was of 1200W.

(*) Qi: Energy provided by 1200W MW Oven =

Power (kW) X t (hr.) = 1.2kW X 3.5/60 hr. = 0.07kWhX860 KCal =60.2 KCal.

(**) Qu: Useful Energy gained by Pinto= M (0.25kg) XCp (0.8 KCal/kg °C) X δT (11.8°C) = 2.36 KCal.

Conclusion

In continuation of my recent published work on various Thermoses to maintain the food/meal hot for 5 -6 hours (lunch time), Aladdin MAGIC Thermos is studied and compared with Normal Aladdin Thermos bottle. Main objective was not to save heat energy but was to extend the heating time of lunch.

Although the Magic Thermos could keep the meal warm for 30-60 minutes more than in Normal Aladdin Thermos Food Flask, some inconvenience in using the magic thermos, like first heating/ microwaving the PCM salt with water, care required for avoiding excessive heating of magic thermos and some increase in price etc., most of the users may not like to switch to Magic bottle. One of my Magic Bottle got spoiled for overheating, heated for 3.5 min.in 1200W Microwave oven, even less than 4 min, recommended on the box.

Later, while looking for more information on internet related to this thermos, came to know that Aladdin stopped the production of this Magic Thermos many years ago without any explanation. Although Normal Aladdin thermos was easily available on Amazon for my study, I spent lot of time/efforts to find Aladdin Magic thermos. Due to hot water and unknown Magic salt, inside plastic bottle temperature is increased, insulation may not resist.

Unfortunately, first bottle (grey) spoiled due to heat and fortunately could complete the study with second (Blue) Magic thermos bottle.

Based on my 50 years of experience with Solar Energy and especially 47 years with Solar Cooking mostly in developing countries, I think, for acceptance of any technology, it is not only technical issues, but also social issues (like little inconvenience as

compared to higher advantages). Although Solar Cookers have many advantages like economy, environment and working unattended etc., but some inconveniences like change in climate/frustrations during solar cooking are sufficient to delay its acceptance. Thus, we have Choices like carrying meals in Plastic pots and heat in MW Oven (More common), heat in Solar Ovens with metallic or heat-resistant plastic pots or carrying hot meals in Conventional Microwaveable thermoses.

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